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Inspection of Data Usage in Cloud using Metering Service

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General Note



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ABSTRACT

Cloud Computing provides the provision of leasing the providers infrastructure for the users working operations and resource utilization by means of effective pay –for –use model. This technology still sounds good as the users are charging for the appropriate services they consumed and users are able to deploy their basic IT needs as well as the peak time configuration needs without making any physical infrastructural investment in their side. But the hypothetical situation arrives to the cloud consumers that whether they are actually charging for what they have consumed and also how the cloud user does know the consumption amount they have made at the particular time slot. Cloud Metering Service can address this issue predominantly and can reveal the token of satisfaction and guarantee to the cloud users on their consumption. Many third party cloud solution providers and cloud

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service providers itself offering the metering services for the cloud users purchased infrastructure. In this survey paper, the purpose of cloud metering services, vendors who offer these services and how the consumptions are monitored and recorded is also discussed.

Keywords: Cloud Computing Meter, Cloud Service Monitoring, Cloud Computing Consumption, Charging Model in Cloud.

1. INTRODUCTION

Cloud Computing is the revolutionizing technology which gained major prominence after 2007, even though Oracle and EMC started using of private cloud in late 1990's itself. The overwhelming usage of internet and the arrival of virtualization elevated the cloud computing to a certain level. Virtualization serves as backbone of cloud computing and it can be best explained with the magician example i.e. viewers in the magic show is pretty sure that the missing object is present inside somewhere in the stage only but they don't know where it is located and that's where magician plays a cameo role which makes the show interesting to the people. The same scenario can be applied to the cloud computing technology as far as virtualization concerns, the cloud users store their data and perform their operations in cloud environment but users not aware of the things that where the data actually stored and where the computations are performed over. Still the users accept the fact that data is stored safely and computations are occurring successfully in any of one provider's infrastructure. Virtualization provides the abstraction to the cloud computing users.

In Cloud Computing environment services are categorized in to three models based on the service reach at the user level [16]. First type Software as a Service (SaaS), which gives subscribers to access the application deployed over the cloud. Second type Platform as a Service (PaaS), which provides the access to the components such as database or network interface to develop and operate their own application. Third type Infrastructure as a service (IaaS), where the entire resources such as storage, bandwidth and network configuration control provided as a service. Cloud monitoring can be done at the all type of models mentioned above but in order to achieve the performance gathering at accurate level we need to measure the hardware resources such as CPU Utilization, Memory read/write and I/O devices transfer, hence the best result which will suit these requirements will be selecting IaaS Model for the metering service [17].

Metering service will benefit both the service provider and consumer. Cloud providers can have a view on the current status on allocated resources in order to handle the future request which may arrive abruptly on any unpredictable situation and also useful to identify the anomaly behavior of the users. In the aspect of cloud consumers, metering will provide a view about how much resources have been consumed so far to the respective category in the infrastructure and also user can analyze the resource requirements such as over utilization, under utilization to make a decision to use them properly and also can draft a path to future resource utilization mapping. Cloud service provider can make a justification towards the cloud users on charging model after providing the metering service access to them.

The Rest of the paper is organized as follows: Section II provides the detail about the popular cloud service providers in the market; Section III explain the reasons why the cloud services need to be monitored; Section IV deals with the current cloud metering application used widely among many cloud consumers; Section V provides the comparison between these metric application on the parameter basis; Section VI concludes the discussion and initiate the future work.

2. CLOUD SERVICE PROVIDERS AT A GLANCE

Since cloud computing emerges as a biggest IT trend in industry, the heavy competition for the cloud provider leader started growing alongside to satisfy the customer business needs. Even though they are more than 100 successful cloud service providers, this paper focuses on some of the giants in cloud providers market. Overview about the service providers are listed below.

Amazon

Amazon, Founded by Jeff Bezos in 1994, entered in to cloud environment initially to support its E-Commerce business applications. The discovery of Amazon cloud service [1] (AWS- Amazon Web Service) evolves as its biggest business by improving the proper utilization of deployed expensive data centers. It is pretty clear that Amazon is the leader in cloud business because of its extended availability as it operates over 4,50,000 servers [6] across 7 data centers on various locations in the world. Also Amazon offers AWS Free Tier, a free cloud web service for period of one year which serves as most prescribed platform for newbie's to know about cloud

computing functionalities at free of charge. The documentation of AWS gives the “clean-slate” solution to start the Amazon’s services.

Windows Azure

Microsoft, a magnum opus company in software industries offers the cloud service as Windows Azure which is considered to be the second best cloud service (next to Amazon Web service) by Gartner, famous analyst in cloud computing. Azure [10] was initiated in the year 2010 and now stands at a very high level by making 200% growth every year. Even though azure provides all the cloud basic services such as virtual machine support, data management and media services it is famous for its reliable content delivery network (CDN) services. Due to the brand of Microsoft, Azure is used by 55% of fortune 500 companies and also as it has deployed 13 data center regions across the world. To get involved with azure services with free of cost, Microsoft provide a one month trial with a condition that user should have the Microsoft Account (windows live ID).

IBM Cloud

IBM (International Business Machine) is a well known giant which serves almost a century in the IT industry. IBM famous for backup and recovery solutions in the cloud as it manages almost 20 billion security events per day. IBM partnered with Nirvanix (leading cloud storage vendors) to provide the smart cloud solution [8] which in turns gives the tight integration of IBM products. As IBM known for the mainframe application, its cloud provides solutions for enterprise application mostly than commercial business application. IBM Soft Layer and IBM Blue Mix is the famous open integration application which allows operating with multiple cloud environments. IBM Cloud provides user with free service for a month to exhaust about its cloud platform.

Google Cloud

Google, unbeatable competitor in the internet market since it evolved in the 1998 and it has entered in to cloud market full- fledged in the year 2010. Similar to Amazon, Google entered in to cloud to serve their 425 million Gmail users and 6 billion hours of YouTube videos per month by enabling it in to its own cloud infrastructure. Google [7] provides the IaaS and PaaS cloud services in the terms of Google Compute Engine and Google App Engine respectively which is widely used by all over the companies and individuals. Google Cloud Storage and Google Big Query are the effective cloud services which take care of online storage and support of SQL queries on the massive Big Data components. Google Cloud provide the free trial for 2 months for the Gmail users to get used to Google cloud environment, but it has marginal limitation on the usage.

3. NEED OF CLOUD MONITORING

A common problem where the cloud clients facing is lack of insight about their own resource consumption in which computation and storage of resources were outsourced. Due to this customers cannot make a notification when they are overcharged accidentally or maliciously. In the current situation cloud users need to purchase the infrastructure from different vendors to support their business and to avoid from vendor lock-in problem. In those situation users are in desperate need to compare the quality and cost effectiveness of the various vendors, so that they can come to a conclusion that what kind of services can be assigned to particular vendor in the future IT budget plan.

Security is the major concern revolving around the cloud for long time and still being in debacle for cloud analyst. A famous quote saying about providing security is “Trust but Verify”, which is acceptable by most IT experts. In order to achieve the verification the cloud monitoring is essential element. [4] [15] Even there are some dashboard application provided by cloud service provider and third party vendors which displays the resource usage of the users cloud, still it can only provide a view of overall consumption which is related to billing parameters in a graphical representation. But to get the interior view and to make checkpoint for the verification for the particular resource using specific parameter, the Metering API which can be accessible through the programming language code derives the expected solution.

4. CLOUD METERING APPLICATIONS

As the necessity of the cloud monitoring started growing, cloud service providers and third party vendors started their metering service by providing the monitoring application for the cloud infrastructure. In this paper some of the cloud metering application which produces reasonable results has been discussed below.

Amazon CloudWatch

The primary leader in cloud business started the metering service in form of Amazon Cloud Watch [3] service as a part of AWS. Amazon CloudWatch is a monitoring service for AWS cloud resources and the applications which run on AWS. Amazon CloudWatch can be used to collect and track metrics; collect and monitor log files and set alarms for exceeding usual billing charges. It is also used to gain system-wide visibility into resource utilization, application performance, and operational health.

Amazon cloudwatch can produce metrics in terms of computation, storage as well as billing for better understanding of AWS users. Amazon offers more than 75 Metrics to make the monitoring more usable and also in the simpler graphical representations. AWS also provides the cloudwatch API for the programmers (independent of programming language) to access the Amazon metrics which relinquishes more opportunity to use with the available monitored data.

Fusion

6fusion [5] was founded in 2008 by John Cowan and Delano Seymour to make accessing, consuming and billing IT infrastructure simple by measuring the compute, storage and network resources in the cloud environment. 6fusion leverages the unprecedented insights gained from IT infrastructure metering to understand what data is actually monitored and how the users can make use of data to improve their cost structure, infrastructure efficiency and ultimately make better IT infrastructure decisions.

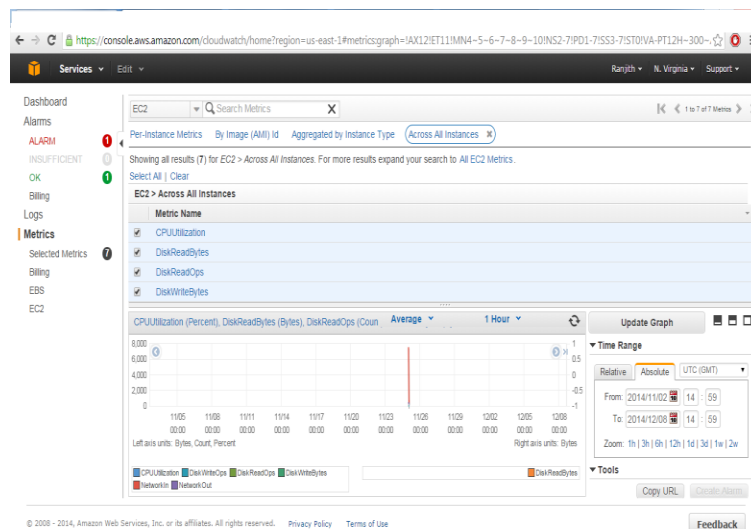


Figure 1 Amazon Cloudwatch – deployed to monitor the resource utilization of imitated instances

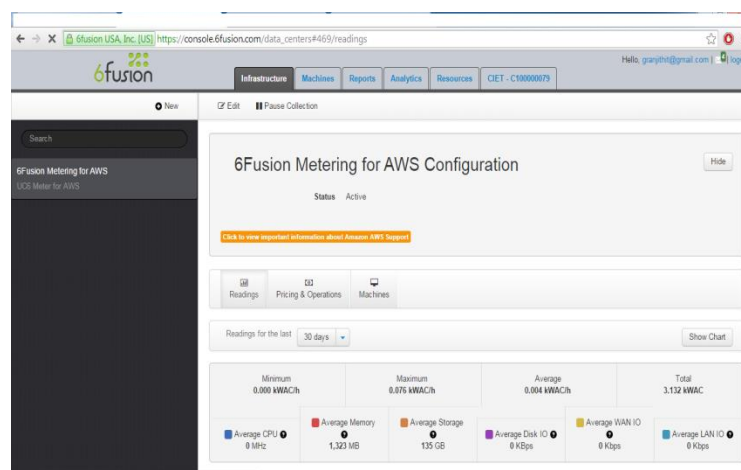


Figure 2 6Fusion providing the standardized view on resource usage across distinct vendors

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6fusion standardizes the economic measurement of IT infrastructure by making a single unit for all metrics across various service providers. Reason for single unit evaluation is to make the cloud user to make reasonable comparison between the resource consumption across various vendors.

6 fusion does this by a metering algorithm called Work Allocation Cube (WAC) which in takes parameters such as CPU Utilization (MHz), Memory usage (MB), Storage (GB), Disk I/O (Kbps), LAN I/O(Kbps), WAN I/O(Kbps) as input and produce the normalized output as WAC.

Scalr

Scalr is primarily a server log monitoring application which also monitors the cloud user instances (Virtual Servers) as well as the metrics supported by cloud service provider. Scalr's fully integrated suite of server monitoring [11], log management and analysis tools gives the power to find and resolve incidents quickly, all from one screen. Scalr aggregates log data and metrics from multiple sources and makes it easy for anyone to monitor, explore, and analyze them.

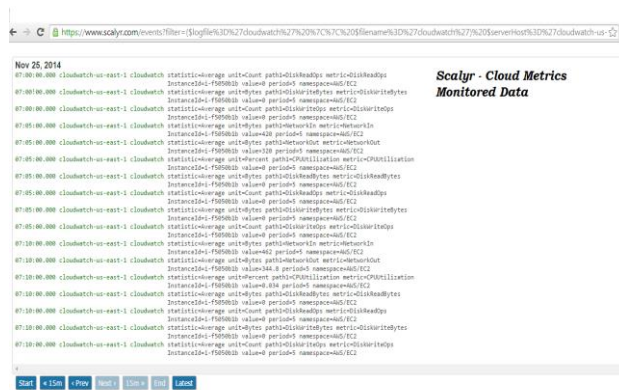


Figure 3 Cloud Metrics Monitored Data



Figure 4 Dynatrace – Monitoring the performance of the cloud instances

calyr just need the authorization information of the user cloud to access the metric information from it. It provides a “Monitor” function, a simple piece of code function which records the instances information and reports it in a time period basis. Metrics needed to be monitored by the user should be specified in the monitor code function. Therefore scalyr provides the option to extract the metrics needed to verify the resource consumption.

Dynatrace

Dynatrace [2] is a tool for capturing the performance of the cloud applications by enabling the production monitoring and user analytics services. The cloud metrics can be accessible through the API with the use of programming SDK support.

AWS provides Java SDK platform where user can use the Java Programming Code through the Eclipse IDE to grab the metrics. The output of the program would be the metrics value of the monitored instances which again fed in to Dynatrace as input and the resultant resource usage view can be generated as graphical representation as shown in the figure.

Flexiant

Flexiant is the cloud solution provider company which started the metering services to resolve the queries raised by various customers on resource monitoring and bill generation. Flexiant [9] comes with a solution for the crisis by providing the Flexiant Cloud Orchestrator, online application which monitors the cloud resources on various parameters such as Instances, Disk, Images, Firewall, Jobs, Snapshots etc.,

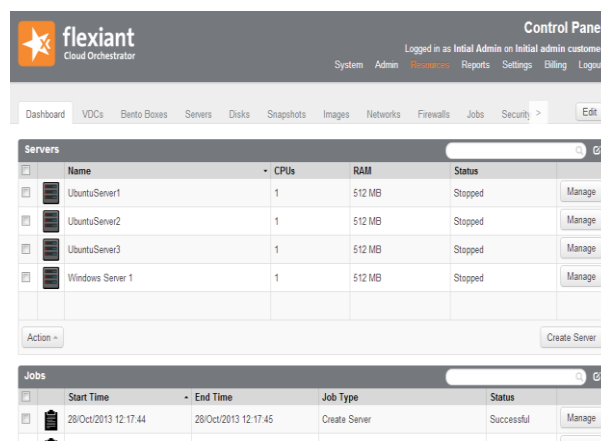


Figure 5 Flexiant- Third party metering service providing a comprehensive view on resources used

S.No	Parameters	AWS CloudWatch	6 Fusion	Scalyr	Dynatrace	Flexiant
1	No. of Metrics considered for Metering	All	Only 6	All	All	All
2	No. of Instances can be monitored simultaneously	Any	Any	One	One	Any
3	Modification on resultant metric view	Restricted	Restricted	Accessible	Accessible	Restricted
4	Support on Multi Vendor Cloud Metering	Not Allowed	Allowed	Not Allowed	Not Allowed	Allowed
5	Charging model of meters	Free Always	Free for 1 Year	Free for 1 Month	Paid	Paid

Figure 6 Comparison table of metering services

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Flexiant developed the Cloud Orchestrator to satisfy on-demand and fully automated provisioning of cloud services. Through the control panel of flexiant, actual users cloud can be controlled by means of initiating or termination. It provides more flexibility and scalability when compared to other metering applications.

5. COMPARATIVE STUDY ON CLOUD METERS

The basic requirement of all the cloud meters is user should provide their credentials on their cloud for the meters to access the information required. So credentials is the mandatory one but each meters has own style of metering in the perspective of features they provide. This paper presents the comparison among the 5 metering applications discussed above.

The cloud meters follows the cloud service provider charging framework structure when calculating for the recording at the situation where free period expires or actual paid model.

6. CONCLUSION AND FUTURE WORK

The Cloud Metering Services able to provide a glimpse of satisfaction to the cloud users as they closely watch their resource consumption and also customers feel they have control on calculation of usage in cloud resources. But metering alone doesn't provide the solution required by the cloud users now because metered data has to further process for validation in order with accounting model of provider infrastructure to initiate the billing purpose. Billing is the thing which keeps business ticking and it is considered to be the final touch to achieve customer satisfaction on the deliverance of cloud service. Cloud user purchase infrastructure from different vendors and assign those instances to various sections such as marketing, development, maintenance etc. So with help of metered data if the consolidated billing (comprises of report of how much resources consumed by various sections under different vendors separately and together) could be generated it might provide the solution required for the cloud users in the current cloud market.

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